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Effect of laser and visible light Irradiation on structural and optical properties of thin films of amorphous selenium and selenium mercury (80:20 composition)

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ABSTRACT

This study is carried out the effect of laser and solar light irradiation on the structural and optical properties of amorphous Selenium and selenium mercury (80:20 composition). Bulk samples were prepared by thermal quenching technique and thin films were papered by thermal evaporation technique on glass substrates. Thin films of a-Se and a-SeHg were irradiated by diode laser (wavelength=405nm, power=100mW) and solar light (energy ~ 0.3MeV calculated by E =hc/λ) for different durations of time. XRD analysis of a-Se and a-SeHg show increase of peak intensity and crystallite size after irradiation indicates the enhancement of crystallinity. Raman analysis of a-Se and a-SeHg also favors this improvement of crystallinity after laser and solar light irradiation. The UV analysis shows the value of optical band gap of a-Se and a-SeHg decreases after irradiation (both laser and solar light). Also it was found that the value of Urbach's energy decreases after laser and solar light irradiation indicates that the disorder has been reduced after irradiation. The other optical parameters like extinction coefficient and absorption coefficient changes accordingly discussed in this study. It was also found that the change of structural and optical parameters is much more in case of solar light irradiation.

Keywords: Thin films of amorphous selenium and selenium mercury; solar and laser irradiation; structural properties; optical properties.

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Introduction

S, Se, and Te based chalcogenide semiconductors have many unique optical properties, they can be used for a wide variety of application **[1]**. These are promising materials for the use of like solar cells, antireflection coating, optical limiting, and manufacture of filters, infrared power delivery, IR emitter, optical rewritable data, IR detector, gratings and optical recording media **[2-8]**. Over many decades Group II–IV materials as possible components in

